UNIVERSITY OF ALBERTA

Long-Range Land Use Plan

Edmonton Campus

April, 1962

THE UNIVERSITY OF ALBERTA ARCHIVES
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LONG RANGE LAND USE PLAN
MAIN CAMPUS
UNIVERSITY OF ALBERTA, EDMONTON

Reported to Full Board, April 6, 1962

Introduction

Following the formation of the Campus Planning Committee it was decided by the Committee that the previous work of the Long Range Planning Committee should be extended to the preparation of a Long Range Land Use Plan. The plan was believed urgent because of

(1) its direct bearing on the policy decision concerning the acquisition of property in Garneau;

(2) its direct bearing on the proper ultimate use of the old Faculty of Education building and the land adjacent it;

(3) the need for selecting the sites of a number of new buildings;

(4) the need for selecting the sites of playing areas, tennis courts and parking lots.

Work on the Long Range Plan was started December 1, 1961 by Mr. H. R. Hawes and members of the Committee, including Mr. L. MacDonald of the Department of Public Works. The services of Mr. John Thornton of the Department of Public Works were obtained later in January 1962.

W.H.J. April 6, 1962

Basis of Plan

The plan is based upon anticipated registrations in the period 1980-1985. The year 1982 and a total registration of some 18,000 is selected. While it is anticipated that the major growth of the University beyond approximately 1980-1985 will be on other campuses, it was considered proper to develop a plan capable of some growth even beyond a registration of 18,000. Registration forecasts developed by Mr. Hawes in consultation with Deans and Directors appear in Table I. These should be taken as illustrative rather than firm.

Development of Plan

The first step in the development of the plan was the preparation of a list of probable new buildings and extensions to existing buildings needed by 1980-1985. This list was developed by the Committee after receiving suggestions from all Deans, Directors and Administrative Officers. Approximate building area requirements were determined consistent with the registration projections.

A list of buildings which will probably be abandoned and demolished by 1982 was also developed. This appears in Table II. The total teaching space which will be lost by demolitions or

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release (as in the case of the old Faculty of Education building) will be some 315,000 square feet.

Reallocation of certain existing space was considered and an illustrative reallocation for 1982 was determined. Details of the existing space, additional space needed by 1982 and an illustrative building occupancy appear in Table III. Additional space totalling some 3.9 million square feet will be needed by 1982.

Consideration was given to building size and the relative merits of housing departments singly or in groups. The factors involved include:

(a) First cost of building.
(b) Economy of land use.
(c) Functional relationships including student movement.
(d) Future cost of expansion and alterations.

A detailed building cost analysis indicated that buildings of two floors plus basement are slightly more economical on a first cost basis than buildings of four, six or eight floors plus basement. Buildings of ten or more floors are significantly more expensive on a unit cost basis. For buildings of eight floors or less the unit cost is insensitive to size for areas per floor above 12,000 square feet (for two floors plus basement) to 24,000 square feet (for eight floors plus basement). These facts are illustrated in Figure 1.

More economical land use is favored by large multi-storey buildings although not to the extent which might at first appear. This is because the land assigned a building must include a reasonable setting and should include provision for staff parking. For a four-storey building of 10,000 square feet per floor the land required is about 54,000 square feet or about one and one-third times the total floor area of the building; for a ten-storey building of 10,000 square feet per floor the land required is 78,000 square feet or three-quarters of the total floor area of the building.

This is further illustrated in Figure 2 which shows that the building land varies only from 30 per cent above to 20 per cent below the total building floor area for floors from four to ten.

Functional requirements may favor grouping of certain departments in a single building but, when consideration is given to future expansions, these needs may be better met by grouping smaller buildings, each capable of individual expansion. Grouping of departments having space requirements of a similar kind is practical because when expansion requires the encroachment of one department into space originally planned for another, this can be done without expensive alterations. Problems of

student movement favor minimum numbers of floors.

A most important consideration is proper planning for expansion. There is no doubt but that housing which will be provided over the next five to ten years for departments and faculties will have to be expanded in the following decade -- probably doubled. This should be anticipated in the planning and locating of buildings. Where departments have special laboratory, library or other needs they should be housed in their permanent homes and their buildings should be designed for expansion without the need for expensive alterations.

Having regard to these factors, it was decided to base the land use plan on:

(a) Individual department or faculty buildings where buildings of 30,000 square feet or more total floor area were contemplated and where separate buildings appeared best from the viewpoint of function and future expansion. Illustrative of this category are buildings for the Faculty of Law, the Faculty of Commerce, the School of Household Economics, and the various departments of the Faculty of Engineering.

(b) Buildings housing groups of departments where the initial size, function and expansion problems indicated grouping to be desirable. Illustrative of this category are the Social Science group (Departments of Geography, History, Sociology, Political Economy and Philosophy), the departments of the Faculty of Agriculture, and Nursing and Physiotherapy.

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(b) Building housing groups of departments where the initial size, function and expansion problems indicated grouping to be desirable. Illustrative of this category are the Social Science group (Departments of Geography, History, Sociology, Political Economy and Psychology), the departments of the Faculty of Agriculture, and Nursing and Physiotherapy.

(c) No. of floors varying from four to seven; building width of about 75 feet; building length to suit the need and varying from a minimum of 100 feet to some 400 feet.

Decisions such as these, ((a), (b) and (c) above), were necessary to form a basis for the land use plan. These particular decisions represent the weight of opinion of the Committee. They are certainly reasonable ones although opinions could differ on certain details. It is important to note, however, that variations in these details, within the limits dictated by the functional needs, would not materially affect the overall land use plan.

In the development of the plan consideration was given to the need for student and staff parking. Parking for 15 - 20 per cent of the student body and nearly all the staff is considered necessary. This means 24 - 36 acres for student parking and about 12 - 15 acres for staff parking by 1982.

Trial Plans

The total useful area of the present campus is some 135 acres. The land suitable for new buildings on the present campus totals 35 acres including land which will be made available by demolition. Efforts were made to develop plans to accommodate the buildings required by 1982 on the available 35 acres and on the 20 acres surrounding the old Education Building.

These efforts were completely unsuccessful. Not only was it not possible to obtain proper functional relationships but even the total of 55 acres fell far short of what was required.

The reason for this is clear. The 3.9 million square feet of new floor area required by 1982 is 90 acres of floor area. Even with buildings averaging six floors (and this appears a maximum average from the viewpoint of function), this means 92 acres of land exclusive of student parking and playing fields. With buildings averaging five floors some 104 acres would be required. Allowing some 30 acres for student parking and 15 acres for playing fields, 135 - 150 acres of land is necessary for the new buildings, student parking and playing fields.

The 20-acre plot surrounding the old Education Building is not really suitable having regard to the functional relationships of the buildings. This means that in addition to the 35 acres available on the present campus, 100 - 115 acres of additional land is required to accommodate the University by 1982.

Final Plan

The final plan is presented as Figure 3. It is the result of many drafts and much study. It envisages an expanded campus planned to meet the academic and the physical requirements of 1982. It covers

(a)	the present campus of	135 acres
(b)	North Garneau:	
	110 - 112 St.; 87 Ave. - Sask. Dr.	42 acres
	109 - 110 St.; 87 Ave. - Sask. Dr.	11 acres
(c)	109 St. - 112 St.; 86 Ave. - 87 Ave.	15 acres
(d)	116 St. - 117 St.; 87 Ave. - Edinboro Rd.	22 acres
		225 acres

It provides 90 acres of new land which, with the 35 acres available (after demolitions) on the present campus, means 125 acres for the new buildings anticipated, student parking and playing fields. This is somewhat above the minimum need but only safely so.

The plan itself is illustrative insofar as individual building sizes, shapes, and exact locations are concerned but it is proposed as firm from the viewpoint of overall land use. It illustrates what the development might be like in 1982 when the registration is some 18,000, after demolition of the buildings listed in Table II and after construction of those suggested by Table III. The plan would be developed in stages starting with the acquisition of land in North Garneau and ultimately involving the purchase of the strip of land between 112th Street and 109th Street and 87th Avenue and 86th Avenue, and the strip between 116th Street and 117th Street and 87th Avenue and Edinboro Road.

If the general plan is approved, it will be developed in more detail to show roads, walks, landscaping and the like. Also, stage plans will be developed to illustrate the demolition and construction at five-year intervals.

Recommendations

The Campus Planning Committee recommends

(1) approval of the Long Range Land Use Plan 1982 on the understanding that (a) the detailed location and size of individual buildings will be subject to specific consideration and approval from time to time and (b) the plan will be further developed in certain details and will be supplemented by five-year stage plans;

(2) immediate commencement of land acquisition in North Garneau following the policy previously submitted;

(3) provided (1) and (2) are approved, endorsation of the Edmonton School Board request for conversion of the old Faculty of Education building to an academic high school; and

(4) that the City of Edmonton be requested to maintain suitable protective zoning on all of South Garneau.

GWG
April 5, 1962

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CWG
April 5, 1962

TABLE I

ENROLMENT FORECASTS *

EDMONTON CAMPUS

DAYTIME CLASSES

Year	Undergraduate and Part time	Graduate Students	Total Edmonton
1961 - 62	6,458	610	7,068
1965 - 66	8,500	1,000	9,500
1970 - 71	10,800	1,550	12,350
1975 - 76	13,200	2,200	15,400
1980 - 81	15,200	2,850	18,050

* Excluding Diploma in Nursing Candidates

HRH:jc
April 3, 1962

TABLE I

ENROLMENT FORECASTS *

KINGSTON CAMPUS

DAYTIME CLASSES

Year	Undergraduate and Part Time	Graduate Students	Total Education
1961 - 62	5,458	610	7,068
1965 - 66	8,500	1,000	9,500
1970 - 71	10,800	1,550	12,350
1975 - 76	13,200	2,300	15,500
1980 - 81	15,200	2,850	18,050

* Excluding Diploma in Nursing Candidates

HBH:je
April 3, 1962

TABLE II

BUILDINGS WHICH WILL PROBABLY BE ABANDONED AND DEMOLISHED BY 1982

EDMONTON CAMPUS

Works Department Buildings

West Laboratory and Greenhouse

Athabasca Hall and Dining Room

Assiniboia Hall

Sociology Building

Greenhouse and Building west of Athabasca Hall

North Laboratory

South Laboratory

Cafeteria Building

Arts Annex

Power House

Infirmary

Faculty Suites (112 Street and 87 Avenue)

Faculty Houses and Garage (northwest corner of campus)

Orchard Buildings

Scout Hut

Lister House

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April 3, 1962

TABLE II

BUILDINGS WHICH WILL PROBABLY BE

ABANDONED AND DEMOLISHED BY 1982

EDMONTON CAMPUS

TABLE III

ILLUSTRATIVE BUILDING OCCUPANCY, 1982

EDMONTON CAMPUS

Estimate of Building Needs - Edmonton Campus - 1982

Department	Appr. Gr. Spc. Ocpd. 1961-62 Sq. Ft.	Est. Gr. Spc. Nd. 1982 Sq. Ft.	Inc. In Gr. Spc. Ovr 1961-62 Sq. Ft.
Faculty of Arts and Science:			
Botany	18,400	116,400	98,000
Chemistry	163,300	319,300	156,000
Classics	1,000	7,400	6,400
English	4,600	37,900	33,300
Fine Arts - Art	6,300	37,500	31,200
Drama	1,300	37,500	36,200
Music	3,800	37,500	33,700
Geography	5,600	35,500	29,900
Geology	34,600	110,000	75,400
History	5,400	26,700	21,300
Mathematics	12,100	34,300	22,200
Modern Languages	9,100	31,800	22,700
Philosophy	1,400	6,600	5,200
Physics	85,900	234,400	148,500
Political Economy	5,500	25,100	19,600
Psychology	7,600	42,200	34,600
Sociology	4,600	21,000	16,400
Zoology	23,900	118,400	94,500
Faculty Totals	394,400	1,279,500	885,100
Household Economics	7,000	39,000	32,000
Law	1,500 (Excl. Lib.)	52,500 (Inc. Lib.)	51,000

Illustrative Building Occupancy 1982 Session

Exstg. Bldg. Name	Bldg. to be Built Soon Name Gr. Sz.	New Buildings Name	Gr. Sz.
		Botany	122,000
Chemistry		Add'l Flrs. (2)	50,000
		Add'l Bldg.	117,000
Arts			
Arts			
		)	
		)Fine Arts	115,000
		)	
		Social Sciences	150,000
Eng. (Part)			
		Social Sciences	See Geog.
		With Physics	See Phys.
Arts			
		Social Sciences	See Geog.
Mth-Physics		Add'l Flrs. (2)	36,000
		Add'l Bldg.	145,000
		Social Sciences	See Geog.
Eng. (Part)			
		Social Sciences	See Geog.
		Zoology	127,000
		H. Ec. & Comm.	69,000
		Law	56,000

TABLE III

ILLUSTRATIVE BUILDING OCCUPANCY, 1982

EDMONTON CAMPUS

Estimate of Building Needs - Edmonton Campus - 1982					Illustrative Building Occupancy 1982 Session			
	Appr. Gr. Spc. Occpd. 1981-82	Est. Gr. Spc. Mid. 1982	Inc. In Gr. Spc. Over 1981-82	Exstg. Bldg. Bldg. to be Built Soon		New Buildings		
Department	Sq. Ft.	Sq. Ft.	Sq. Ft.	Name	Name	Bene Gr. Sz.	Name	Gr. Sz.
Faculty of Arts and Sciences:								
Botany	78,400	116,400	38,000				Botany	122,000
Chemistry	103,300	319,300	156,000	Chemistry			Add'l Flrs. (2)	50,000
							Add'l Bldg.	117,000
Classics	1,000	7,400	6,400	Arts				
English	4,500	37,900	33,300	Arts				
Fine Arts - Art	6,300	37,500	31,200					
Drama	1,300	37,500	36,200				Fine Arts	115,000
Music	3,800	37,500	33,700					
Geography	5,500	35,500	30,000				Social Sciences	150,000
Geology	34,600	110,000	75,400	Eng. (Part)				
History	3,400	26,700	23,300				Social Sciences	See Geog.
Mathematics	12,100	34,300	22,200				With Physics	See Phys.
Modern Languages	9,100	31,800	22,700	Arts				
Philosophy	1,400	6,600	5,200				Social Sciences	See Geog.
Physics	65,900	238,400	184,500	With-Physics			Add'l Flrs. (2)	36,000
							Add'l Bldg.	145,000
Political Economy	5,500	25,100	19,600				Social Sciences	See Geog.
Psychology	7,600	42,200	34,600	Eng. (Part)				
Sociology	4,600	21,000	16,400				Social Sciences	See Geog.
Zoology	23,300	128,400	94,500				Zoology	127,000
Faculty Totals	378,400	1,279,300	885,100					
Household Economics	7,000	39,000	32,000				H. Ec. & Comm.	69,000
Law	1,500	52,500	51,000				Law	56,000
(Excl. Libr.)(Inc. Libr.)								

Department	Appr. Gr. Spc. Ocpd. 1961-62 Sq. Ft.	Est. Gr. Spc. Nd. 1982 Sq. Ft.	Inc. In Gr. Spc. Ovr 1961-62 Sq. Ft.	Exstg. Bldg. Name	Bldg. to be Built Soon Name	Bldg. to be Built Soon Gr. Sz.	New Buildings Name	New Buildings Gr. Sz.
Engineering:								
General Use	8,500	24,200	15,700				)Complex of	
Chem. & Petroleum	42,700	121,600	78,900				)8 new bldgs.	
Civil	60,400	172,100	111,700				)(See Eng.	
Electrical	55,500	158,100	102,600				) Report)	590,000
Mechanical	26,700	76,000	49,300				)	
Mining & Metallurgy	14,700	41,800	27,100				)	
Faculty Totals	208,500	593,800	385,300				)	
Nursing	6,500	10,300	3,800				Nrsg. & Physio	43,400
Physiotherapy & O.T.	20,000	30,000	10,000				Nrsg. & Physio	See Nrsg.
Education (Inc. Lib. & Gym)	45,900	240,000	194,100		Ed.	290,000		
Commerce	7,700	20,000	12,300				H. Ec. & Comm.	See H. Ec.
Pharmacy	22,100	54,400	32,300				Pharmacy	58,000
Dentistry	64,900	90,000	25,100	Med. Scs.				
Medicine:								
Biochemistry	28,300	45,000	16,700	Med. Scs.				
Physiology	12,300	19,800	7,500	Med. Scs.				
Pharmacology	10,800	17,300	6,500	Med. Scs.				
Bacteriology	13,800	19,300	5,500	Med. Scs.				
Anatomy	27,200	38,600	11,400	Med. Scs.				
Med. & Surgical Res.	21,000	45,000	24,000	Med. Scs.				
Pathology		40,000	40,000				Path. & Bact.	40,000
Clinical Services		90,000	90,000				Clinical Servs.	90,000
Radiation Biology		27,000	27,000				Radiation Biol.	27,000
							Add'l Bldg.	30,000
Faculty Totals	113,400	342,000	228,600					

Department	Appr. Dr. Spc. Dept. 1961-62 Sq. Ft.	Est. Spc. Dr. Mo. 1962 Sq. Ft.	Inc. In Spc. Dr. Over 1961-62 Sq. Ft.	Exstg. Bldg. Bldg. to be Built Soon Name	Dr.	Sq.	New Buildings Name	Dr.	Sq.
Engineering:									
General Use	8,500	24,200	15,700				)Complex of		
Chem. & Petroleum	42,700	121,600	78,900				)8 new bldgs.		
Civil	60,400	172,100	111,700				)(See Eng.		
Electrical	95,500	138,100	102,600				) Report)		590,000
Mechanical	26,700	76,000	49,300				)		
Mining & Metallurgy	14,700	41,800	27,100				)		
Faculty Totals	208,500	593,800	385,300				)		
Nursing	6,500	10,300	3,800				Nurs. & Physio		43,400
Physiotherapy & O.T.	20,000	30,000	10,000				Nurs. & Physio		See Nurs.
Education (Inc. Lib. & Gym)	45,500	240,000	194,100			34.			290,000
Commerce	7,700	20,000	12,300				H. Ec. & Comm.		See H. Ec.
Pharmacy	22,100	54,400	32,300				Pharmacy		58,000
Dentistry	64,900	90,000	25,100	Med. Sci.					
Medicine:									
Biochemistry	28,300	45,000	16,700	Med. Sci.					
Physiology	12,300	19,800	7,500	Med. Sci.					
Pharmacology	10,600	17,300	6,700	Med. Sci.					
Bacteriology	13,600	19,300	5,700	Med. Sci.					
Anatomy	27,200	38,900	11,400	Med. Sci.					
Med. & Surgical Res.	21,000	45,000	24,000	Med. Sci.					
Pathology		40,000	40,000				Path. & Anat.		40,000
Clinical Services		90,000	90,000				Clinical Servs.		90,000
Radiation Biology		27,000	27,000				Radiation Biol.		27,000
							Acad'l Bldg.		70,000
Faculty Totals	113,400	342,300	228,900						

Department	Appr. Gr. Spc. Ocpd. 1961-62 Sq. Ft.	Est. Gr. Spc. Nd. 1982 Sq. Ft.	Inc. In Gr. Spc. Ovr 1961-62 Sq. Ft.	Exstg. Bldg. Name	Bldg. to be Built Soon Name	Gr. Sz.	New Buildings Name	Gr. Sz.
Physical Education	183,000	360,000	177,000				New Bldgs.	179,000
Agriculture:								
Agricultural Economics		12,700	12,700	)			)	
Agricultural Engineering	8,700	12,000	3,300	)			)	
Animal Science	11,600	45,000	33,400	)Part in			)Part in	
Dairy Science	9,600	33,700	24,100	)Biological			)New Agric.	101,000
Entomology	8,700	25,500	16,800	)Sciences			)Bldg.	
Genetics	9,200	39,300	30,100	)Bldg.			)	
Plant Science	15,100	46,500	31,400	)			)	
Soil Science	12,900	22,700	9,800	)			)	
Soil Survey, Feed Test	5,800	18,700	12,900	)			)	
Faculty Totals	81,600	256,100	174,500					
Extension (Inc. Library)	12,500	35,000	22,500				Extension	70,000
Classroom Space	135,000	337,500	202,500				Pro-rated Amgst Other Bldgs.	
Library (Excl. Law, Ed. & Extn.)	75,700	413,000	337,300	Rthrfrd. Lb.	Res. Lib. 1st St.	149,000	Res. Lib. 2nd & 3rd St.	108,000
							Add'l Bldg.	80,000
Services (Works, Etc.)	30,000	75,000	45,000				Services	75,000
Residences (Inc. Cafeteria)	158,000	715,000	557,000		Resid. #1,2	216,000	Resid. #3	108,000
					Fd. Svs. #1	68,000	Resid. #4,5,6	324,000
							Food Serv. #2	68,000
							Cafeteria	20,000
Administration (Inc. Press)	54,000	143,000	89,000				Admin. & Press	89,000

Department	Appr. Dr. Spc. Oepd. 1961-62 Sq. Ft.	Est. Dr. Spc. No. 1962 Sq. Ft.	Ins. In Dr. Spc. Ovr 1961-62 Sq. Ft.	Exstg. Bldg. Bldg. to be Built Soon		New Buildings	
				Name	Name Dr. Sz.	Name	Dr. Sz.
Physical Education	183,000	360,000	177,000			New Bldgs.	179,000
Agriculture:							
Agricultural Economics		18,700	18,700	)	)		
Agricultural Engineering	8,700	13,000	3,300	)	)		
Animal Science	11,600	45,000	33,400	)Part in	)Part in		
Dairy Science	9,500	33,700	24,200	)Biological	)New Agric.		101,000
Entomology	8,700	25,500	16,800	)Sciences	)Bldg.		
Genetics	9,200	39,300	30,100	)Bldg.	)		
Plant Science	15,100	45,500	31,400	)	)		
Soil Science	13,900	22,700	9,800	)	)		
Soil Survey, Feed Test	5,800	18,700	12,900	)	)		
Faculty Totals	81,500	256,100	174,500				
Extension (Inc. Library)	12,500	35,000	22,500			Extension	70,000
Classroom Space	135,000	337,500	202,500			Pre-rated Angel Other Bldgs.	
Library (Excl. Law, Ed. & Extn.)	75,700	413,000	337,300	Rbkfrd. Lb. Rea. 1st St.	1Lb,000	Rea. Lib. 2nd & 3rd St.	108,000
						Addl Bldg.	80,000
Services (Works, Etc.)	30,000	75,000	45,000			Services	75,000
Residences (Inc. Cafeteria)	150,000	725,000	557,000	Resid. 216,000 #1,2 Fd. Srv. 52,000 #1		Resid. #3 Resid. #4,5,6 Food Serv. #2 Cafeteria	108,000 324,000 58,000 20,000
Administration (Inc. Press)	41,000	143,000	80,000			Admin. & Press	89,000

Department	Appr. Gr. Spc. Ocpd. 1961-62 Sq. Ft.	Est. Gr. Spc. Nd. 1982 Sq. Ft.	Inc. In Gr. Spc. Ovr 1961-62 Sq. Ft.	Exstg. Bldg. Name	Bldg. to be Built Soon Name	Gr. Sz.	New Buildings Name	Gr. Sz.
Others (St. Hlth., McEachern Lab, Etc.)	27,000	75,000	48,000	Eng. (Part)	St. Hlth. Cr.	13,200	Part New Bldg.	See Ext.
Armed Forces	2,700	15,800	13,100		Armd. Frcs.	15,800		
Students' Union	34,000	100,000	66,000				Sub. Addition	66,000
	1,685,400	5,276,900	3,591,500			752,000		3,171,400
Loss of Teaching Space Through Demolition & Loss of Old Education Building	315,000							
Total Increase Necessary (Appr.)			3,906,500					3,923,400

HRH:jc
April 3, 1962

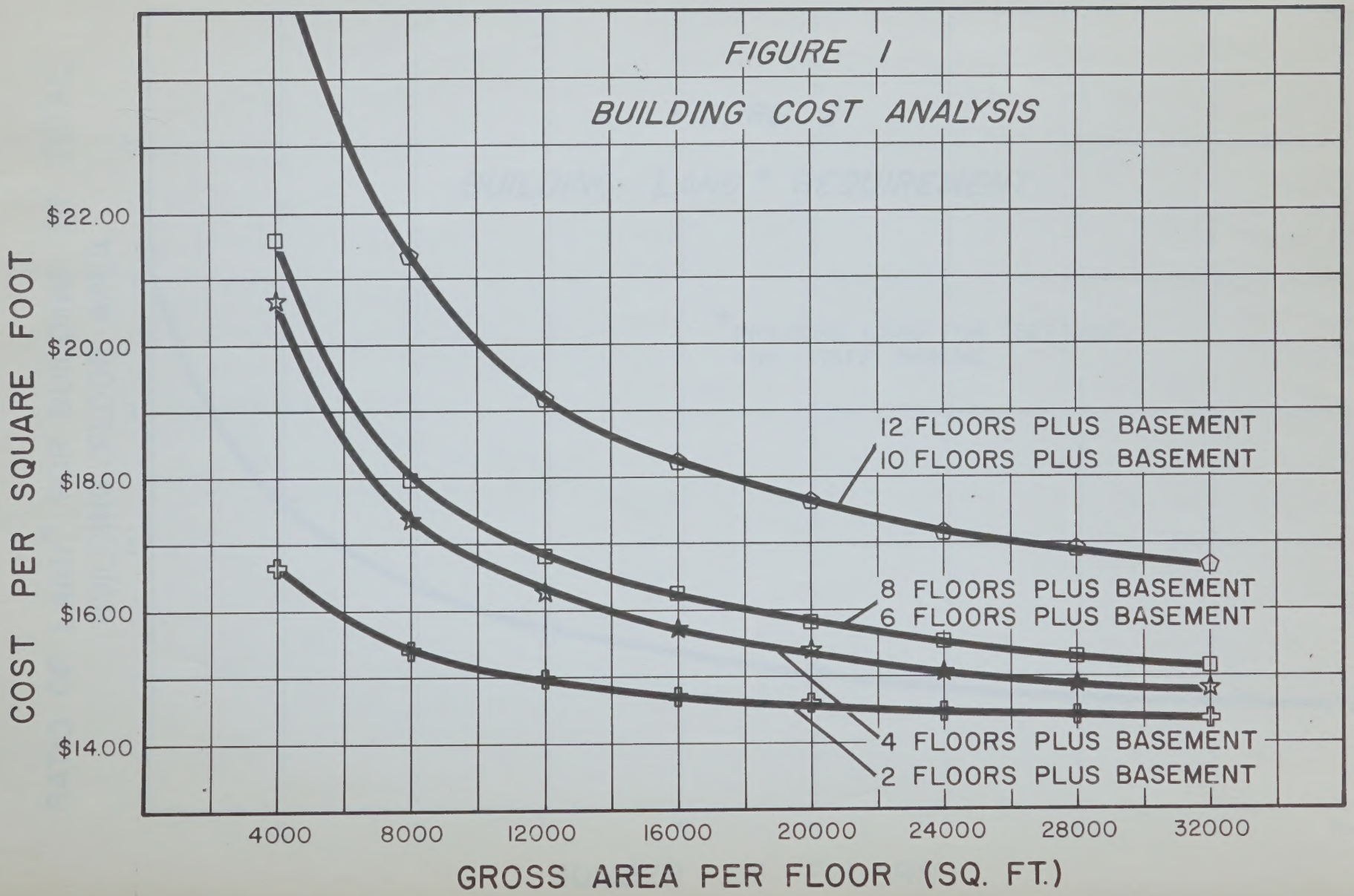
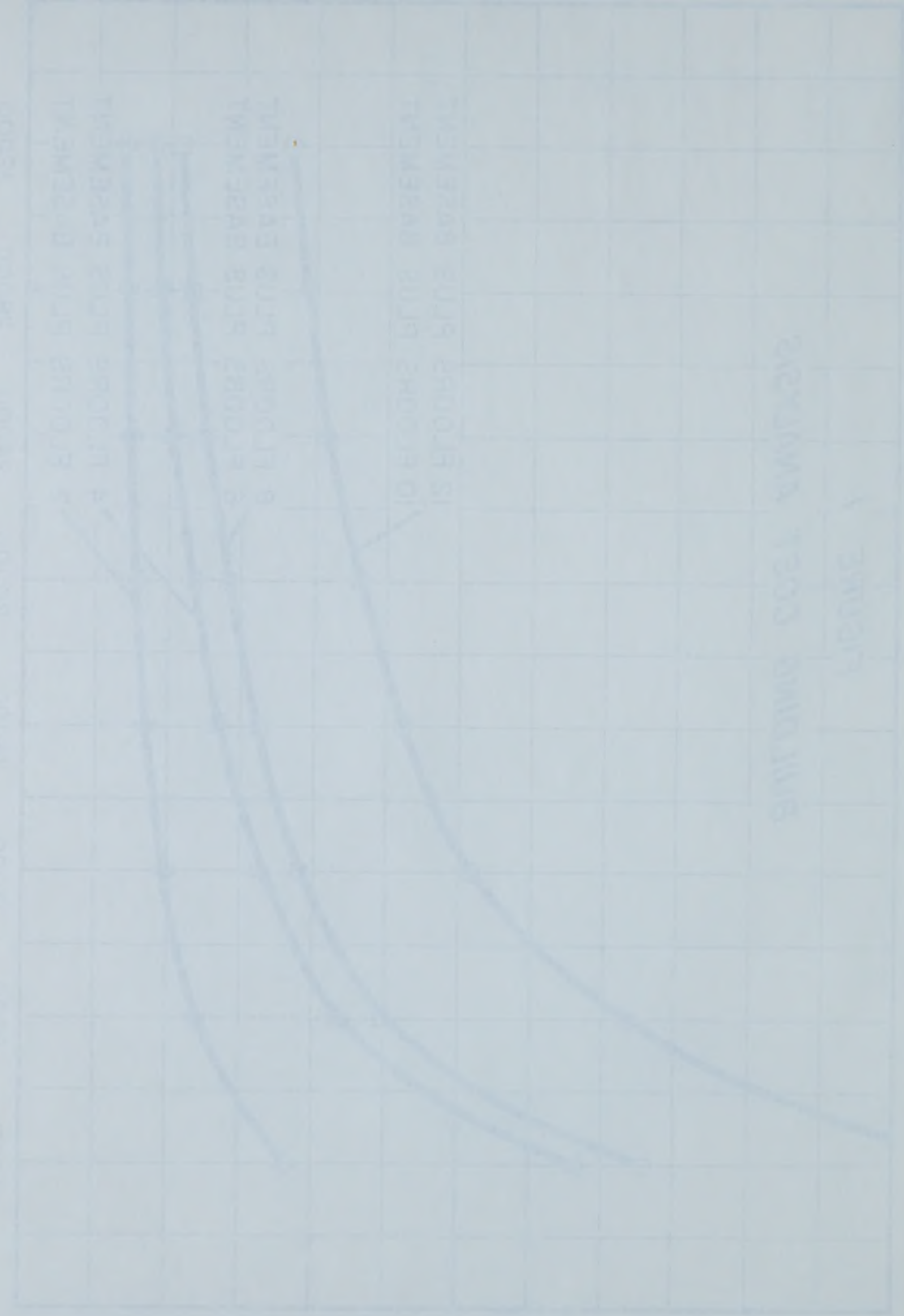


FIGURE 1
BUILDING COST ANALYSIS
COST PER SQUARE FOOT
$22.00
$20.00
$18.00
$16.00
$14.00
12 FLOORS PLUS BASEMENT
10 FLOORS PLUS BASEMENT
8 FLOORS PLUS BASEMENT
6 FLOORS PLUS BASEMENT
4 FLOORS PLUS BASEMENT
2 FLOORS PLUS BASEMENT
4000
8000
12000
16000
20000
24000
28000
32000
GROSS AREA PER FLOOR (SQ. FT.)



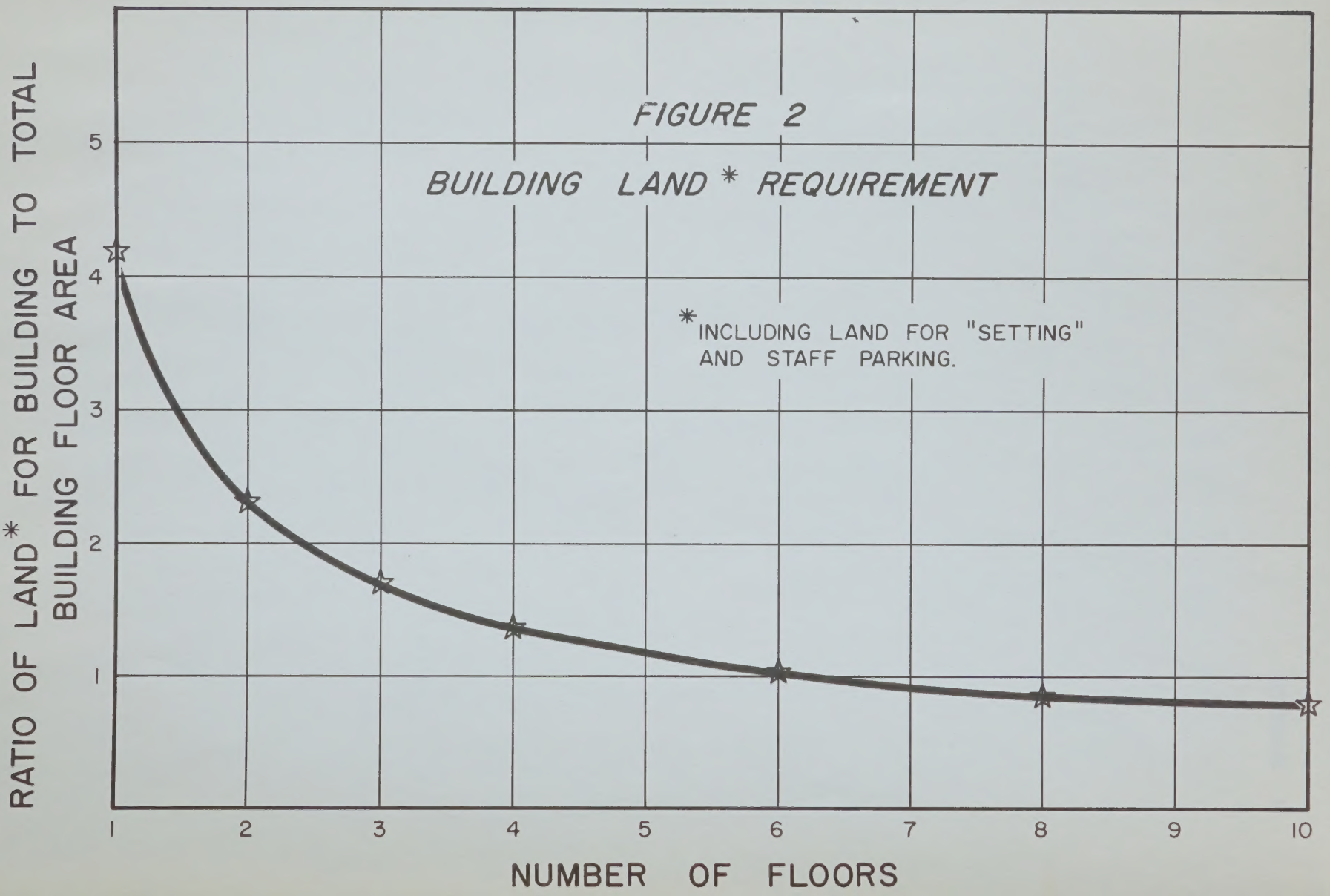
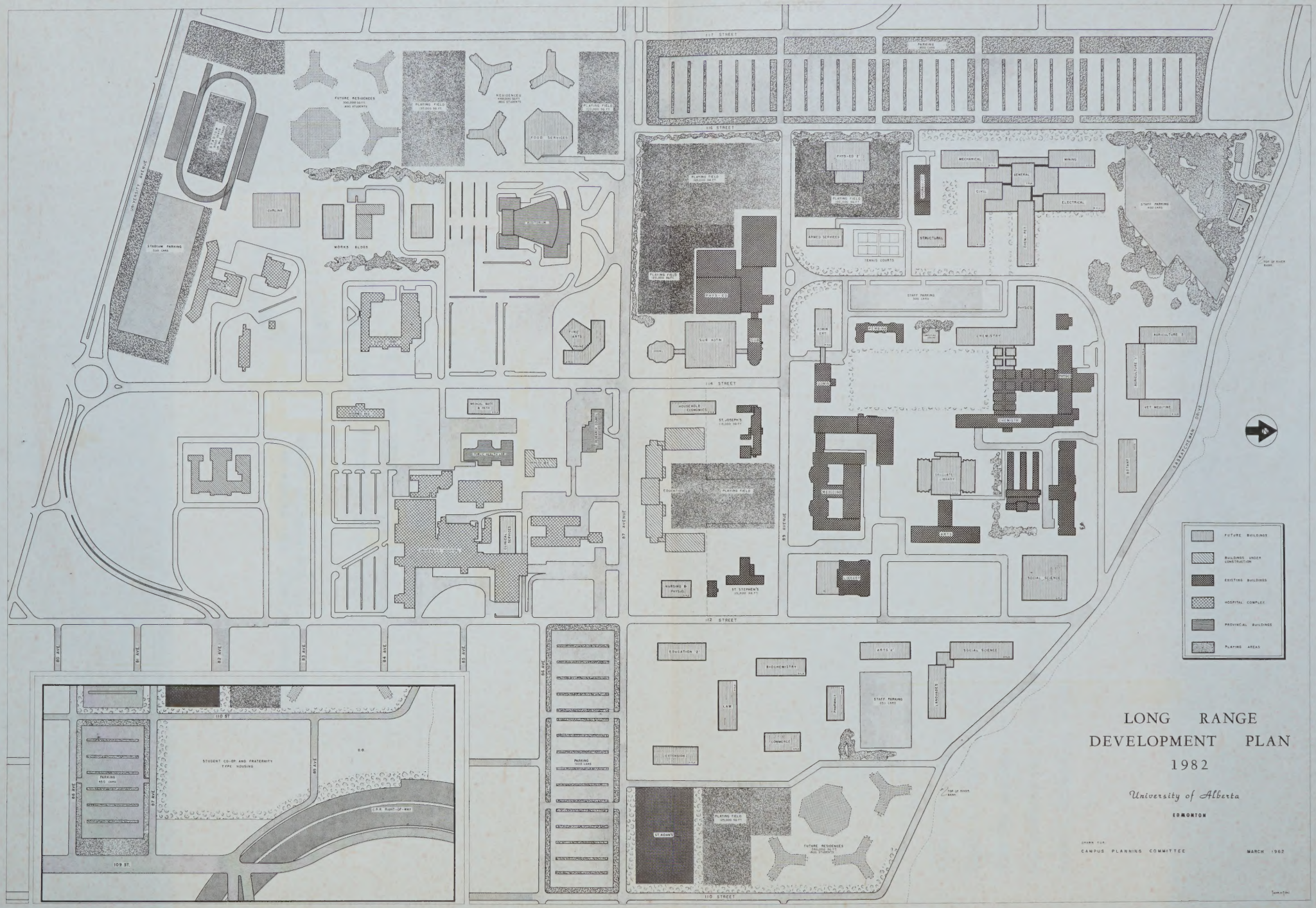


FIGURE 2
BUILDING LAND * REQUIREMENT
* INCLUDING LAND FOR "SETTING" AND STAFF PARKING.
RATIO OF LAND* FOR BUILDING TO TOTAL BUILDING FLOOR AREA
1
2
3
4
5
1
2
3
4
5
6
7
8
9
10
NUMBER OF FLOORS


LONG RANGE
DEVELOPMENT PLAN
1982
University of Alberta
EDMONTON
DRAWN FOR
CAMPUS PLANNING COMMITTEE
MARCH 1962
FUTURE BUILDINGS
BUILDINGS UNDER CONSTRUCTION
EXISTING BUILDINGS
HOSPITAL COMPLEX
PROVINCIAL BUILDINGS
PLAYING AREAS
117 STREET
116 STREET
114 STREET
112 STREET
110 STREET
109 ST.
STUDENT CO-OP AND FRATERNITY TYPE HOUSING
C.P.R. Right-of-way
STADIUM PARKING 500 CARS
STAFF PARKING 300 CARS
STAFF PARKING 400 CARS
STAFF PARKING 250 CARS
PARKING 1000 CARS
PARKING 455 CARS
FUTURE RESIDENCES
RESIDENCES
PLAYING FIELD
FOOD SERVICES
WORKS BLDGS
CURLING
TENNIS COURTS
ARMED SERVICES
PHYS-ED 'B'
MECHANICAL
MINING
GENERAL
CIVIL
ELECTRICAL
STRUCTURAL
CHEMISTRY
PHYSICS
AGRICULTURE
AGRICULTURE 2
VET MEDICINE
BIOCHEMISTRY
ARTS 'A'
SOCIAL SCIENCE
EDUCATION 2
LAW
PHARMACY
LIBRARIES
COMMERCE
EXTENSION
ST. JOSEPH'S
ST. STEPHEN'S
ST. ADAN'S
HOUSEHOLD ECONOMICS
NURSING & PHYSIOTHERAPY
MEDICAL BLDG & PATH
SCIENCE BUILDING
MECHANICAL ENGINEERING
ELECTRICAL ENGINEERING
CIVIL ENGINEERING
MINING & METALLURGY
GENERAL SERVICES
SUB AUTH
ARTS
ADMIN
BUSINESS
EDUCATION
ENGINEERING
HUMANITIES
SOCIAL SCIENCE
BIOLOGY
CHEMISTRY
PHYSICS
ADMIN ENT
LIBRARY
BUSINESS
ENGINEERING
HUMANITIES
SOCIAL SCIENCE
BIOLOGY
CHEMISTRY
PHYSICS
AGRICULTURE
VET MEDICINE
LIBRARY
STAFF PARKING 400 CARS
STAFF PARKING 300 CARS
STAFF PARKING 250 CARS
PARKING 1000 CARS
PARKING 455 CARS
FUTURE RESIDENCES
PLAYING FIELD
PLAYING FIELD
PLAYING FIELD

UNIVERSITY OF ALBERTA
MAY 24 1962
PRESIDENT'S OFFICE

SUPPLEMENT TO APRIL 1962 REPORT ON LONG RANGE LAND USE PLAN EDMONTON CAMPUS

Members of the Board of Governors, when considering the proposal of the Campus Planning Committee concerning the Long Range Land Use Plan for the Edmonton Campus, requested further information on (a) Unit Combined Cost of Buildings and Land as related to Number of Floors and Floor Area and (b) Relative Economics of Alternate Schemes for Student Parking. The additional information follows:

(a) Unit Combined Cost of Buildings and Land

The total cost of buildings and land expressed per sq. ft. of building area was calculated from the data of Figures 1 and 2 of the previously mentioned report on the assumption of a land cost of $120,000 per acre or $2.75 per sq. ft. The total unit cost is expressed, as a function of number of floors, for various individual floor areas in Figure 4, and for various total floor areas in Figure 5. Certain conclusions may be drawn:

1. Total unit costs are more affected by total floor area (or building size) than by number of floors.

2. Total unit costs for a 40,000 sq. ft. building are nearly 10% greater than for a 200,000 sq. ft. building.

3. For any building size from 40,000 sq. ft. up the total unit costs are essentially the same over three different numbers of floors.

Total unit cost ratios and the range of the optimum number of floors are expressed as functions of the total building floor area in Figure 6. This summarizes the picture. It should be noted that deviations from the assumed land cost and other factors related to building function and planning for future expansion will, in individual cases, affect the overall decision as to the best building size, floor area and number of

floors. Subject to this, however, it does appear that there is less than a 10 per cent difference in total unit building and land cost for buildings ranging from 40,000 sq. ft. of 2, 3 or 4 floors to 200,000 sq. ft. of 6, 7 or 8 floors. Future planning should be for buildings falling within this range unless there are important functional or other reasons justifying deviation.

(b) Relative Economics of Alternate Schemes for Student Parking

Mr. J. J. Bakker, Chairman of the Parking Subcommittee of the Grounds and Utilities Committee, was asked to make a comparison of the relative cost of student parking immediately adjacent the University campus (as contemplated in the Long Range Land Use Plan April 1962) and on the University farm. In the case of parking at the University farm, he was also asked to make an allowance for bus transportation of the students from the farm to the campus and return.

Mr. Bakker has now completed the study and the significant results of it are shown in Figure 7. In this figure the daily cost of parking per stall is indicated for various financing periods from 5 to 50 years. It is to be noted that the cost of parking itself is much lower at the farm than on the campus but that, with the inclusion of bus transportation, the total cost of farm parking and transportation exceeds the cost for parking on the campus for any period of financing in excess of 20 years. Also to be noted is that the farm is not on a natural driving route to the campus, and many students would have to drive past the campus to reach the farm. This would add 15 - 20 cents per car as an additional student driving cost, and would make the total cost of parking at the farm materially above that on the campus. Details of the assumptions made by Mr. Bakker and the unit cost appear in Tables 1 and 2.

Detailed studies were not made of the cost of parking in underground or above ground structures, but with the initial cost of such structures ranging from $1,200.00 to $2,000.00 per stall, it is known that the unit cost would be materially greater than that of surface parking on the campus.

Mr. Bakker has drawn to the attention of the Campus Planning Committee the fact that student parking on the campus in the numbers contemplated would provide a tremendous additional peak load for the Edmonton City roads, and recommends that detailed discussions should be held between University authorities and the City before final decisions are made.

The Campus Planning Committee believes that the idea of student parking on the farm be abandoned, and that provision should be made, as needed, for student parking on the periphery of the campus on the grounds that this would not only be by far more convenient for the students, but it would also, in the long run, be much more economical. In addition, peripheral student parking lots would provide an "escape valve" for University expansion should growth be more than anticipated. The Committee recognizes that such planning would add to the City's transportation problems, but believes that this is a matter which should be faced in the interest of the University.

TABLE I

PARKING AT THE UNIVERSITY

(per Stall basis)

FINANCING PERIOD, YEARS

Initial Cost	5	10	15	20	25	30	40	50
Land Cost	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00
Paving Cost	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00
Coin Collection	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Landscaping Cost	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
TOTAL:	$1,259.00	$1,259.00	$1,259.00	$1,259.00	$1,259.00	$1,259.00	$1,259.00	$1,259.00
C.R.F. (6%)	.2374	.1358	.1029	.0871	.07823	.07265	.06646	.06344
Annual Cost								
Amortization	$ 300.00	$ 170.00	$ 130.00	$ 110.00	$ 98.50	$ 91.50	$ 83.70	$ 80.00
Policing	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Maintenance	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Snow Removal	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
TOTAL:	$ 334.00	$ 204.00	$ 164.00	$ 144.00	$ 132.50	$ 125.50	$ 117.70	$ 114.00

TABLE I

PARKING AT THE UNIVERSITY

(per Stall basis)

FINANCING PERIOD, YEARS

	5	10	15	20	25	30	40	50
Initial Cost								
Land Cost	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00
Paving Cost	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00
Coin Collection	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Landscaping Cost	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
TOTAL:	$1,259.00	$1,259.00	$1,259.00	$1,259.00	$1,259.00	$1,259.00	$1,259.00	$1,259.00
C.R.F. (6%)	.2374	.1358	.1029	.0871	.0782	.0765	.0664	.0614
Annual Cost								
Amortization	$ 300.00	$ 170.00	$ 130.00	$ 110.00	$ 98.50	$ 91.50	$ 83.70	$ 80.00
Policing	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Maintenance	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Snow Removal	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
TOTAL:	$ 334.00	$ 204.00	$ 164.00	$ 144.00	$ 132.50	$ 125.50	$ 117.70	$ 114.00

TABLE I

PARKING AT THE UNIVERSITY
(continued)

Number of weeks per year:	28
Number of days per year:	168
Turnover 1.1 per day or	185

FINANCING PERIOD, YEARS

	5	10	15	20	25	30	40	50
Cost per Day	$1.80	$1.10	$0.89	$0.78	$0.72	$0.68	$0.63	$0.62

Cost of paving per sq. ft.	$.28
Coin collection gate	$5,000
Landscaping	30-50 cents per sq. ft.
Snow removal	$0.45 per cu. yd. (2 ft. per year)
Maintenance Cost	$0.05 per month per sq. ft.

TABLE 1

PARKING AT THE UNIVERSITY
(continued)

Number of weeks per year: 28

Number of days per week: 168

Turnover 1.1 per day or 185

FINANCING OBLIGO, YEARS

Cost per Day	5	10	15	20	25	30	40	50
	$1.80	$1.10	$0.89	$0.78	$0.72	$0.68	$0.63	$0.62

Cost of paving per sq. ft., $3.28

Coin collection Rate $3,000

Landscaping 30-50 cents per sq. ft.

Snow removal $0.45 per cu. yd.
(2 ft. per year)

Maintenance Cost $0.05 per month per sq. ft.

TABLE 2

PARKING AT THE FARM

(per stall basis)

	FINANCING PERIOD, YEARS							
	5	10	15	20	25	30	40	50
Initial Cost								
Land Cost	$ 96.50	$ 96.50	$ 96.50	$ 96.50	$ 96.50	$ 96.50	$ 96.50	$ 96.50
Paving Cost	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00
Landscaping	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
TOTAL:	$223.50	$223.50	$223.50	$223.50	$223.50	$223.50	$223.50	$223.50
C.R.F.	.2374	.1358	.1029	.0871	.07823	.07265	.06646	.06344
Annual Cost								
Amortization	$ 53.00	$ 30.40	$ 23.00	$ 19.45	$ 17.70	$ 16.25	$ 14.80	$ 14.20
Policing	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Maintenance	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Snow Removal	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
TOTAL:	$ 87.00	$ 64.40	$ 57.00	$ 53.45	$ 51.70	$ 50.25	$ 48.80	$ 48.20
Cost per Day (168 days, turnover 1.0)	$ 0.53	$ 0.39	$ 0.34	$ 0.32	$ 0.31	$ 0.30	$ 0.29	$ 0.29
Bus (Capital	0.45	0.26	0.20	0.26	0.23	0.20	0.26	0.23
Bus (Operating	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
TOTAL:	$ 1.25	$ 0.93	$ 0.82	$ 0.86	$ 0.82	$ 0.78	$ 0.83	$ 0.80

TABLE 2

PARKING AT THE PARK

(per stall basis)

FINANCING PERIOD, YEARS

	5	10	15	20	25	30	40	50
Initial Cost								
Land Cost	$ 96.50	$ 96.50	$ 96.50	$ 96.50	$ 96.50	$ 96.50	$ 96.50	$ 96.50
Paving Cost	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00
Landscaping	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
TOTAL:	$223.50	$223.50	$223.50	$223.50	$223.50	$223.50	$223.50	$223.50
C.R.F.	.237#	.1358	.1029	.0871	.07823	.07205	.06646	.06346
Annual Cost								
Amortization	$ 53.00	$ 30.40	$ 23.00	$ 19.45	$ 17.70	$ 16.25	$ 14.80	$ 14.20
Policing	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Maintenance	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Snow Removal	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
TOTAL:	$ 87.00	$ 64.40	$ 57.00	$ 53.45	$ 51.70	$ 50.25	$ 48.80	$ 48.20
Cost per Day (185 days, turnover 1.0)	$ 0.53	$ 0.39	$ 0.34	$ 0.32	$ 0.31	$ 0.30	$ 0.29	$ 0.29
Bus ((Capital	0.45	0.26	0.20	0.26	0.23	0.20	0.26	0.23
(Operating	0.28	0.29	0.28	0.28	0.28	0.28	0.28	0.28
TOTAL:	$ 1.25	$ 0.93	$ 0.82	$ 0.86	$ 0.82	$ 0.78	$ 0.83	$ 0.80

TABLE 2

PARKING AT THE FARM

(per stall basis)

(continued)

BUS TRANSPORTATION COSTS	ANNUAL COST PER STALL		
	Years	Total	Per Day
Capital Cost $12,000	5 yrs.	$75.00	$0.45
Maximum life 10-15 years	10 yrs.	43.00	0.26
Operating cost $0.70 per mile	15 yrs.	32.50	0.20
Average occupancy of bus 40%	20 yrs.	43.00	0.26
2 round trips per car	25 yrs.	37.50	0.23
2 persons per car	30 yrs.	32.50	0.20
76 passengers per bus or	40 yrs.	43.00	0.26
1 bus for 38 cars	50 yrs.	37.00	0.23

TABLE 2

PARKING AT THE FARM

(per stall basis)

(Continued)

BUS TRANSPORTATION COSTS

Capital Cost $12,000

Maximum life 10-15 years

Operating cost $0.70 per mile

Average occupancy of bus 40

2 round trips per day

5 days per week

50 passengers per bus or

1 bus for 38 cars

Years	ANNUAL COST PER STALL Total	Per Day
5 yrs.	$75.00	$0.45
10 yrs.	43.00	0.24
15 yrs.	32.50	0.20
20 yrs.	43.00	0.26
25 yrs.	72.50	0.43
30 yrs.	32.50	0.20
40 yrs.	43.00	0.26
50 yrs.	37.00	0.23

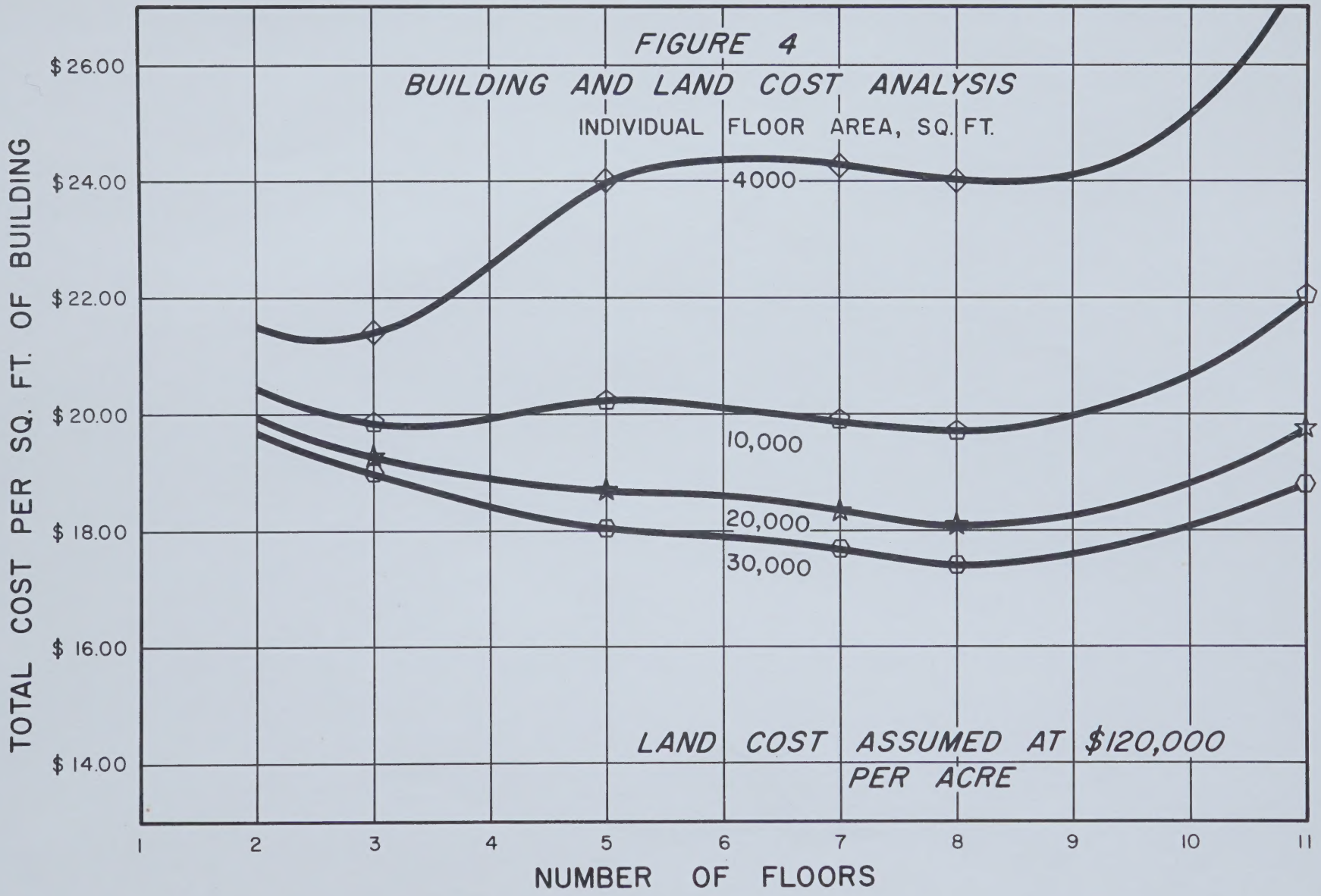


FIGURE 4
BUILDING AND LAND COST ANALYSIS
INDIVIDUAL FLOOR AREA, SQ. FT.
4000
10,000
20,000
30,000
LAND COST ASSUMED AT $120,000 PER ACRE
TOTAL COST PER SQ. FT. OF BUILDING
$ 26.00
$ 24.00
$ 22.00
$ 20.00
$ 18.00
$ 16.00
$ 14.00
1
2
3
4
5
6
7
8
9
10
11
NUMBER OF FLOORS

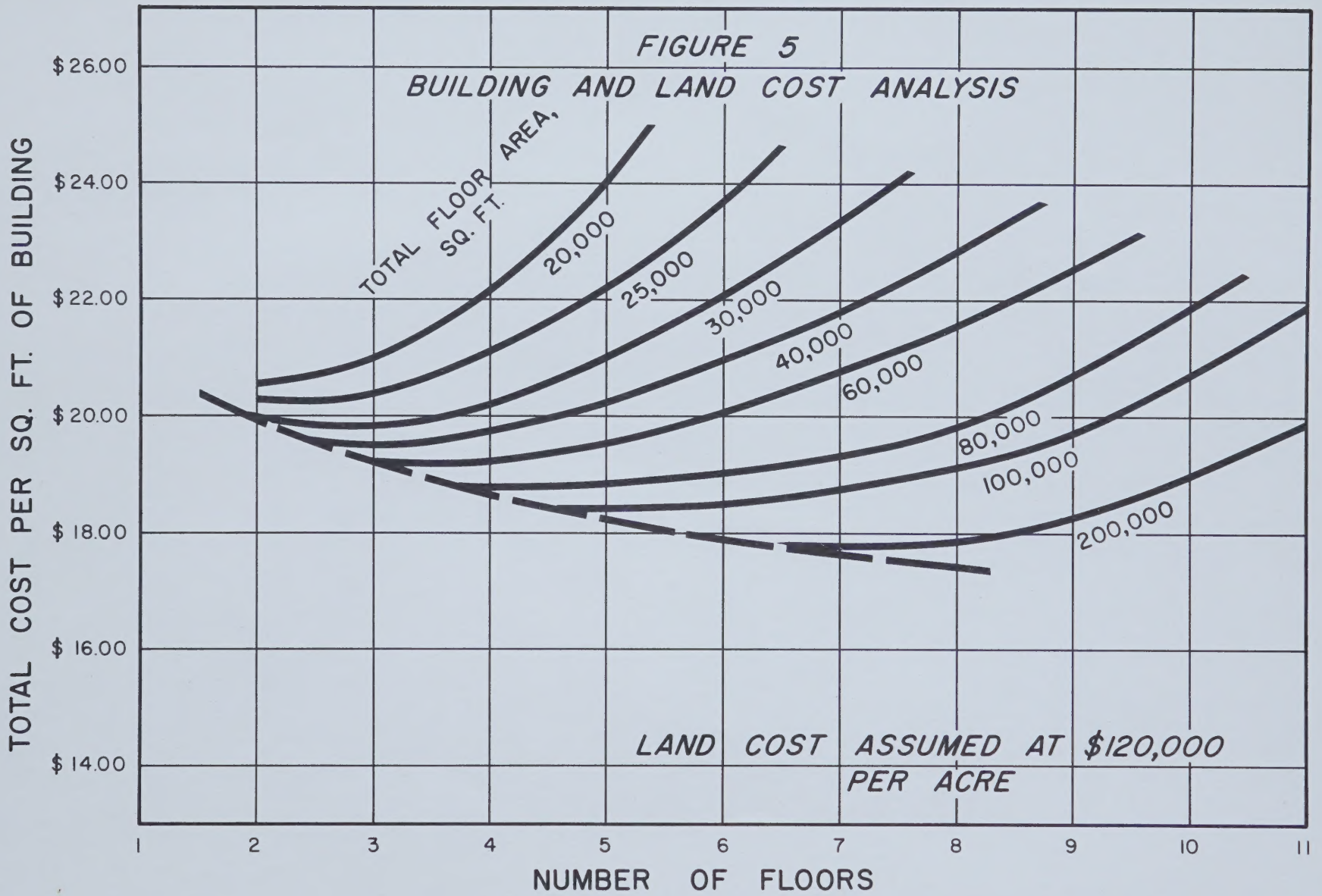
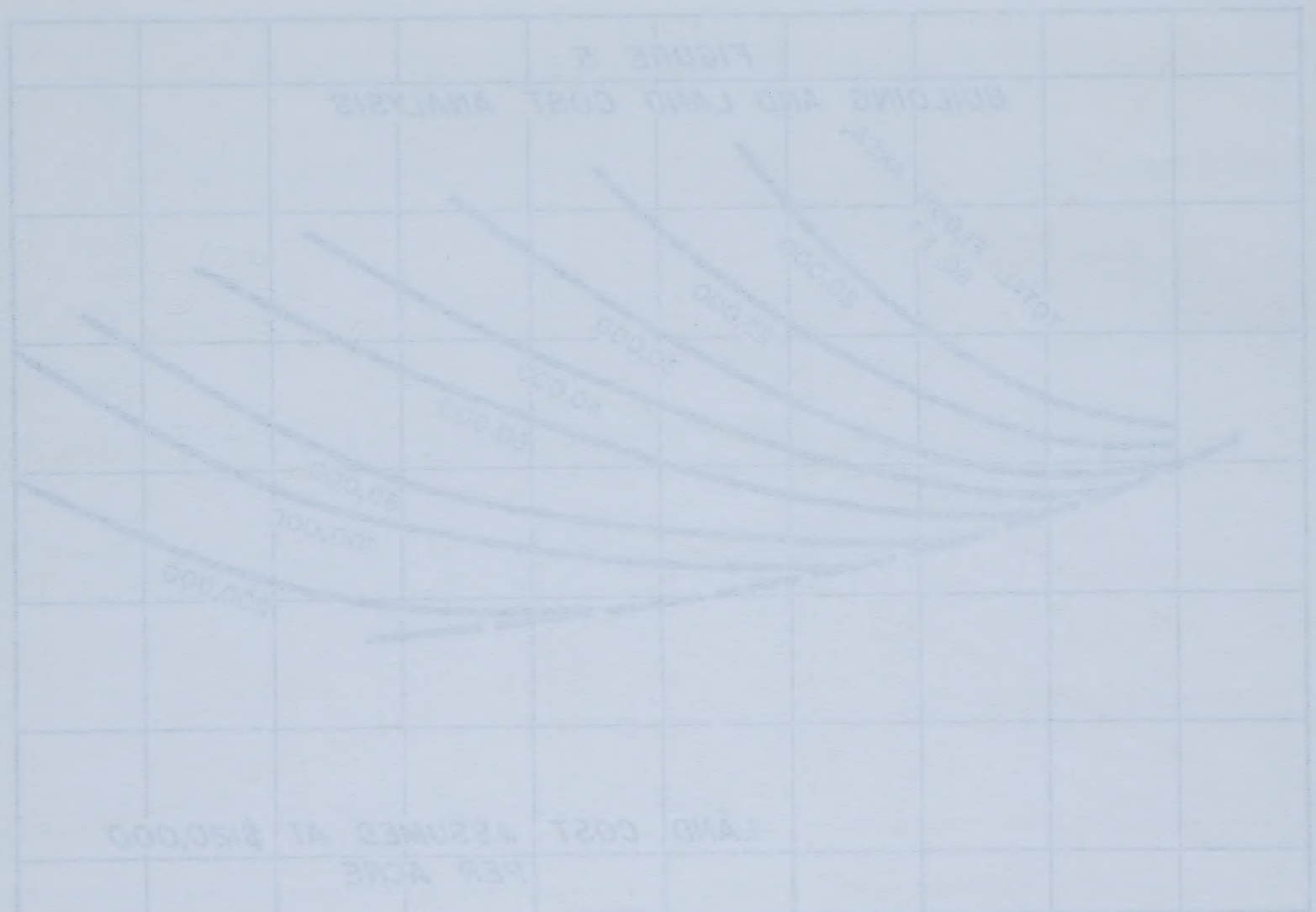


FIGURE 5
BUILDING AND LAND COST ANALYSIS
TOTAL FLOOR AREA, SQ. FT.
20,000
25,000
30,000
40,000
60,000
80,000
100,000
200,000
LAND COST ASSUMED AT $120,000 PER ACRE
TOTAL COST PER SQ. FT. OF BUILDING
$26.00
$24.00
$22.00
$20.00
$18.00
$16.00
$14.00
1
2
3
4
5
6
7
8
9
10
11
NUMBER OF FLOORS



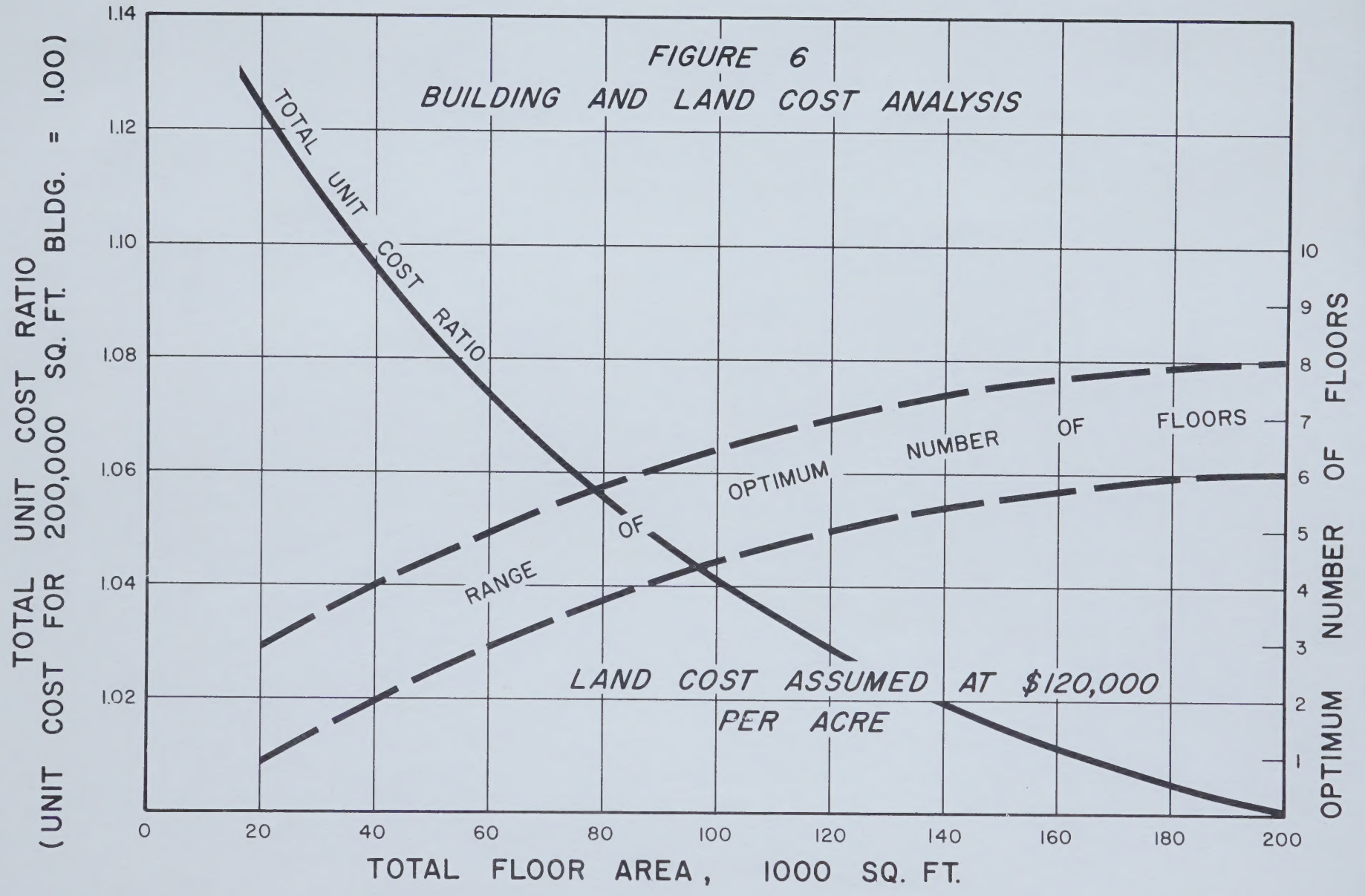


FIGURE 6
BUILDING AND LAND COST ANALYSIS
TOTAL UNIT COST RATIO
(UNIT COST FOR 200,000 SQ. FT. BLDG. = 1.00)
1.14
1.12
1.10
1.08
1.06
1.04
1.02
TOTAL UNIT COST RATIO
OPTIMUM NUMBER OF FLOORS
RANGE OF OPTIMUM NUMBER OF FLOORS
LAND COST ASSUMED AT $120,000 PER ACRE
10
9
8
7
6
5
4
3
2
1
0
20
40
60
80
100
120
140
160
180
200
TOTAL FLOOR AREA, 1000 SQ. FT.

OPTIMUM NUMBER OF FLOORS
1 2 3 4 5 6 7 8 9 10
FLOORS
NUMBER
OPTIMUM
RANGE
TOTAL UNIT COST RATIO
LAND COST ASSUMED AT $150,000 PER ACRE
TOTAL FLOOR AREA, 1000 SQ. FT.
0 50 100 150 200 250
80 90 100 110 120
FIGURE 5
BUILDING AND LAND COST ANALYSIS
TOTAL UNIT COST RATIO
(UNIT COST FOR 500,000 SQ. FT. BLDG. = 1.00)

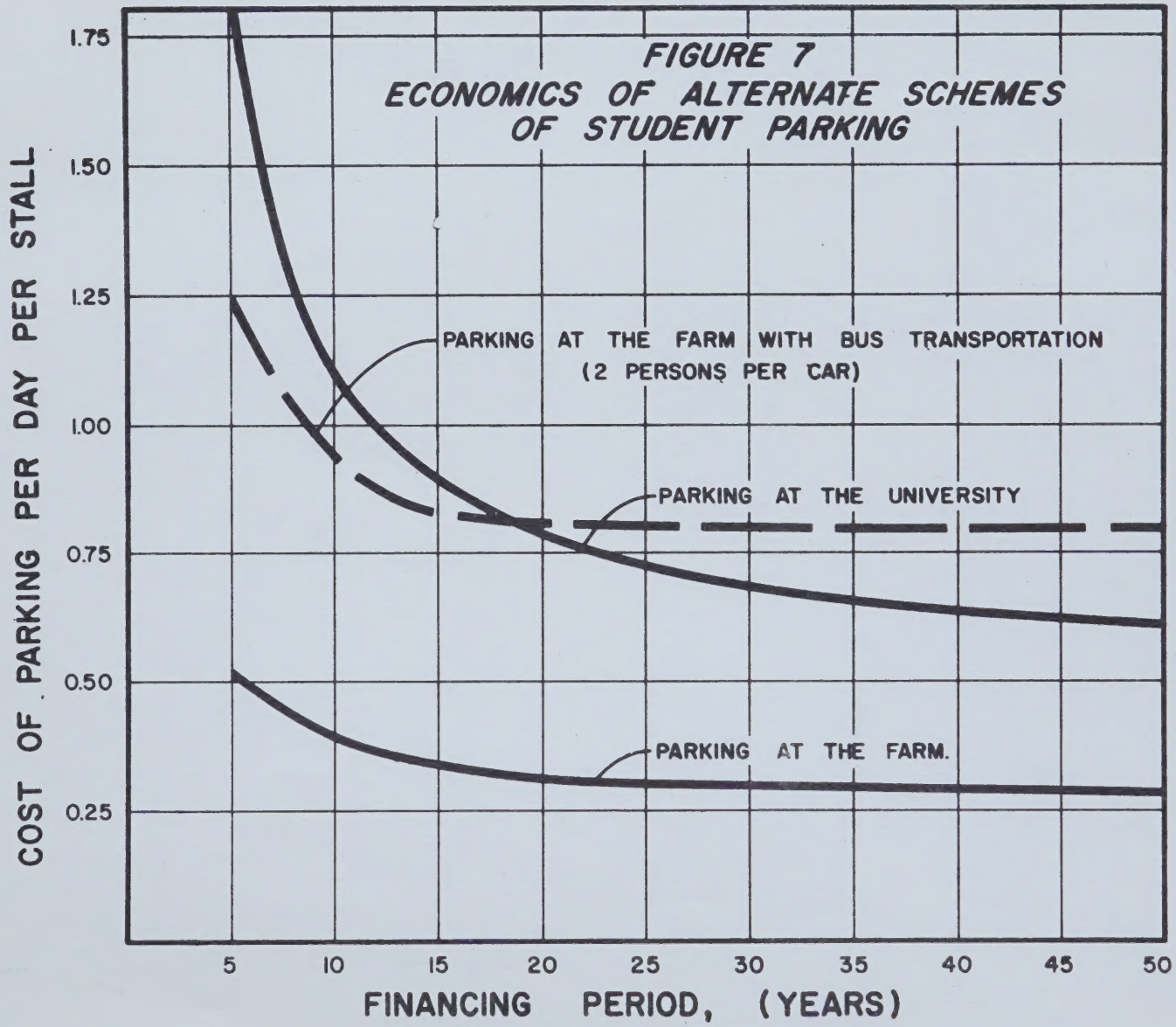


FIGURE 7
ECONOMICS OF ALTERNATE SCHEMES
OF STUDENT PARKING
COST OF PARKING PER DAY PER STALL
1.75
1.50
1.25
1.00
0.75
0.50
0.25
PARKING AT THE FARM WITH BUS TRANSPORTATION
(2 PERSONS PER CAR)
PARKING AT THE UNIVERSITY
PARKING AT THE FARM.
5
10
15
20
25
30
35
40
45
50
FINANCING PERIOD, (YEARS)

FIGURE 7
ECONOMICS OF ALTERNATE SCHEMES
OF STUDENT PARKING
PARKING AT THE UNIVERSITY
PARKING AT THE FARM
PARKING AT THE FARM WITH BUS TRANSPORTATION
(2 PERSONS PER CAR)
COST OF PARKING PER DAY PER STALL
$2.50
$2.00
$1.50
$1.00
$.50
$.25
5
10
15
20
25
30
40
45
50
PARKING PERIOD (HOURS)

University of Alberta

Long-Range Planning Committee

Explanatory Notes to Accompany Form LRPC-1

1. FTE (full-time equivalent) Student

In order to be able to express the teaching load carried by any department in terms that would make comparisons between departments possible, and also to take into account the "cross-over" load (teaching given to students registered in other faculties) as well as the load created by part-time and special students, the concept of the "full-time equivalent" student has been adopted.

It has been determined that the average undergraduate student requires 17 hours of contact with the teaching staff per week. This was calculated on the basis of one hour of lecture per week for both terms being equal to one credit-hour; two or three hours of laboratory work being equated to one hour of lecture; and so on. When the sum of all the credit-hours of teaching given by all departments (the sum of the number of credit hours of each subject times the enrolment in that subject for every department and faculty) was divided by the day-time enrolment (including part time and full time students), the "average" student (or FTE student) was found to create a demand for 17 credit-hours of teaching.

For graduate students, 6 student-credit-hours of instruction was taken as the average.

2. FTE Academic Staff member or teaching assistant

Full-time equivalent academic staff are "composite" staff members who, in theory, would devote their entire time to teaching. One FTE teaching staff member would provide as much instruction as two or more part-time teaching staff members. FTE staff was calculated on the ratio of:

1 FTE staff member per 18 FTE students at the lower level of undergraduate instruction in any department

1 FTE staff member per 12 FTE students at the upper level of undergraduate instruction in any department

1 FTE staff member per 6 FTE students at the graduate level of instruction in any department

The division of subjects into upper, lower and graduate level was done on the basis of the subject numbering system. The results were also used to arrive at weighted averages for undergraduate laboratory space.

3. Space Allowances

The space allowances per student or per staff member were originally developed by the University of California. In some cases the figures have been revised; further revisions may be necessary, because of differences in emphasis and approach in undergraduate and graduate degree programs between the University of Alberta and the University of California. The table below shows the requirements of your department as calculated on the basis of the space allowance standards provisionally adopted. If you do not agree with the allowances shown, please indicate in the column provided what you consider to be a more correct allowance.

Please note the following:

(a) Staff research laboratory space

Staff research laboratory space includes research laboratory service rooms (including animal quarters in regular academic buildings), libraries and other collections within the instructional departments, and academic conference rooms.

(b) Offices for staff members

Academic staff space allowances in general are net square feet per FTE faculty member (and equivalent ranks) and teaching assistant.

(c) Administrative offices

Space is pro rated per FTE staff member, and includes space allowed for administrative conference rooms.

(d) Storage, departmental shops, etc.

This includes manufacturing and maintenance shops within the instructional department, but does not include buildings and grounds maintenance shops and storage.

August, 1962

University of Alberta

Campus Planning Committee

Space Planning Standards

A. Offices

	Net sq. ft.
President's office	300
Vice-President	250
Assistant to President	130
Dean of Faculty or Director of School	200
Associate or Assistant Dean	150
Head of Department	150
Full-time teaching staff	130
Teaching assistants (2 or 3 per office)	70 each
Graduate students (with thesis work) (4 to 6 per office)	50 each
Departmental offices (including waiting area, working area, storage, etc.)	
1 steno or clerk	275
2 stenos or clerks	400
3 stenos or clerks	475
4 stenos or clerks	550
5 stenos or clerks	625
6 stenos or clerks	700
Faculty or School offices - as for Departments	
Secretaries (incl. work area, storage area, waiting area, etc. pro rated)	80
Technicians	50

B. Classrooms

To calculate approximate total area to be devoted to classrooms in a new building, take total FTE students to be served by departments which will occupy the building 5 years beyond proposed year of opening of building, and allow 12 square feet net per FTE student.

The sizes and capacities of classrooms to be made out of the space thus allowed must be reviewed from the point of view of departmental wishes as to maximum class sizes and the overall classroom situation of the university. At the present time (August, 1962) the overall situation indicates that the demand for classrooms is approximately as follows:

Lecture Rooms
Sizes and Capacities
(furnished with tablet-arm chairs)

Number of Student Stations	Number of Square Feet per Station	Number of Square Feet per Room
10	23.0	230
12	21.8	262
14	20.5	287
16	19.3	309
18	18.3	329
20	17.4	348
22	16.8	370
24	16.3	391
26	15.9	413
28	15.6	437
30	15.3	459
32	15.0	480
34	14.8	503
36	14.5	522
38	14.3	543
40	14.1	564
45	13.8	621
50	13.4	670
55	13.1	721
60	12.8	768
65	12.6	819
70	12.4	868
75	12.2	915
80	12.0	960
85	11.9	1012
90	11.7	1053
95	11.6	1102
100	11.5	1150
110	11.3	1243
120	11.1	1332
130	10.9	1417
140	10.8	1512
150	10.7	1605
160	10.5	1680
170	10.4	1768
180	10.3	1854
190	10.3	1957
200	10.2	2040
250	9.9	2475

c.

Teaching Laboratories

Summary of Data Used by Various Institutions

Legend: A - University of Illinois
B - Report to University of Manitoba by consultants
C - University of Alberta
D - California State Department of Education, 1956
E - "eport to McGill University by consultants

	Square feet per student station				
	A	B	C	D	E
Accounting		26			
Actuarial Mathematics and Statistics		el. 26 ad. 30			
Animal Science - Poultry		50			
Nutrition		40			
Physiol.		40			
Genetics		30			
Dairy Sci		60			
Anthropology - see Sociology					
Applied Mechanics - see Theoretical and Applied Mechanics					
Architecture - drafting	60				
Art -	60				
-Sculpture		40			
-Pottery		40			
-Graphics		40			
-Design		35			
-Drawing		35			
-Painting - studio		35			
- thesis		90			
Arts and Crafts				30-40	
Astronomy				30	
Biological Sciences	50			s. 37.5 l. 33.3	
Biochemistry -		40			37.5
- honors		50			40
Botany - elementary		30	40		30
- advanced		40-50	36-51		

	A	B	C	D	E
Business Education - typing and shorthand	30				
Chemistry -	50,70,100			40	
- 1st & 2nd yr		40			
- 3rd yr, Inorg, Inst Anal.		45			
- Adv. Organic		50			
- Phys.; Hon.Org.		60			
Civil Engineering - drafting	40		25-30	30	
- Concrete & soils	150		150		
- Soils				30	
- Structures			150-200	60	
- Surveying & map.				40	
- Str. of materials			75		
- Design			40		
Economics - statistics	35				
Education	40				
Electrical Engineering -	75,150		75		
- Measurements		40			
- High freq'cy		35			
- Control syst.		40			
- Electronics		40		60	
Entomology - physiology		50			
- taxonomy		50			
- ecology		50			
- elementary		30			
General Engineering-draft'g	40				
Geography - physical		40	40		
- Cartography, el.			50		
int. & adv.			70		
- regional classes			30		
Geology -	35			36	
- elementary		30			
- advanced		36-50			
Genetics					30
Home Economics	50				
Industrial Engineering - see Mechanical Engineering.					
Languages - listening labs	30				

	A	B	C	D	E
Mechanical & Industrial Engineering - drafting	40				
- metallography				40	
- heat, ventil. & air conditioning	40				
- foundry, metal processing, heat treatment, internal combustion & power	150				
Meteorology			25 & 60		
Microbiology - elementary		30			
- advanced		45			
Pharmacology					42
Pharmacy - Chem., jr & sr		40			
- pharmacognoscy jr & sr		40			
- pharmacology		50			
- pharm. preps		40			
- dispensing		60			
- manufacturing		60			
Physical Sciences - general				30	
Physics -	50-70			30	
- electronics, el'cy		30			
- elementary; light, mechanics, heat.		35			
- advanced (hons.)		40			
Physiology - med students					42
- others					32
Planning studio			50		
Plant Science - cytology		50			
- cereals		40			
- plant science		30			
- biometrics		25			
Psychology -	40			25	20
- senior		30			
- mental testing		75			
- clinical test.		75			
Social Sciences - small				25	
- large				22.5	
Sociology & Anthropology	35				
Soils (Agriculture)		42			
Speech - listening labs	50				

A	B	C	D	E

	A	B	C	D	E
Theoretical & Applied Mechanics - concrete testing	150				
- hydraulics	250		200-250		
Zoology - elementary		30-36	30		30
- advanced		36-45	36-54		40-50

Preparation Space - 15-20% of laboratory space, depending upon level of instruction.

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I. C.
MADE IN CANADA